360381

FLOOD INSURANCE STUDY

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VILLAGE OF CALEDONIA, NEW YORK
LIVINGSTON COUNTY

DECEMBER 1, 1980

federal emergency management agency
federal insurance administration

COMMUNITY NUMBER - 360381

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PUBLISHED SEPARATELY:

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
VILLAGE OF CALEDONIA, NEW YORK

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Village of Caledonia, Livingston County, New York, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Caledonia to the regular program of flood insurance by the Federal Insurance Administration (FIA). Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

The purpose of the Flood Insurance Study was explained at the initial Consultation and Coordination Officer's (CCO) meeting on July 27, 1976, attended by representatives of the Village of Caledonia, the FIA, and the State of New York Department of Environmental Conservation (DEC), the study contractor.

A search for basic data was made at all levels of government. The U. S. Geological Survey (USGS) was contacted and provided information coordinated with this study. Information regarding flow data was not available from the USGS, since there are no existing flow records in the area.

On January 19, 1978, an intermediate CCO meeting was held with officials of the village to obtain additional local input.

The final consultation and coordination meeting was held on April 11, 1980, where the final draft of the Flood Insurance Study was presented for further local comment. The meeting was attended by village officials and residents, and representatives of the FIA and the study contractor.

1.3 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were prepared by the New York State Department of Environmental Conservation for the Federal Insurance Administration, under Contract No. H-3945. This work, which was completed in August 1979, covered all significant flooding sources in the Village of Caledonia.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study includes the incorporated area of the Village of Caledonia, Livingston County, New York. The area of study is shown on the Vicinity Map (Figure 1).

The only stream studied in detail was Spring Creek, a tributary to Oatka Creek, which is located in the Town of Wheatland. Spring Creek originates in the center of the Village of Caledonia and proceeds in a northerly direction to the Chessie System at the northern corporate limits. This portion within the village, which has a total length of about 4,200 feet, was studied in detail. To the south of the Conrail tracks, an area along State Route 5 was studied for sheet flow and ponding problems. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction for the next five years, through August 1984.

2.2 Community Description

The Village of Caledonia was named by the Scots who settled the area beginning in 1799, Caledonia being the Roman name for Scotland. The village is located in the northern part of Livingston County, about 15 miles southwest of the City of Rochester. It is bordered on the north by the Town of Wheatland, Monroe County, and on the other three sides by the Town of Caledonia, Livingston County.

Caledonia was incorporated in 1891. In 1864, a fish hatchery was established in the village by Seth Green. The hatchery, the oldest continuous one in the state, is now owned and operated by the State of New York (Reference 1). The population of the village was 2,327 in 1970, an increase of 410 persons or 21 percent over the census report of 1960. Continued growth is anticipated in the community (Reference 2).

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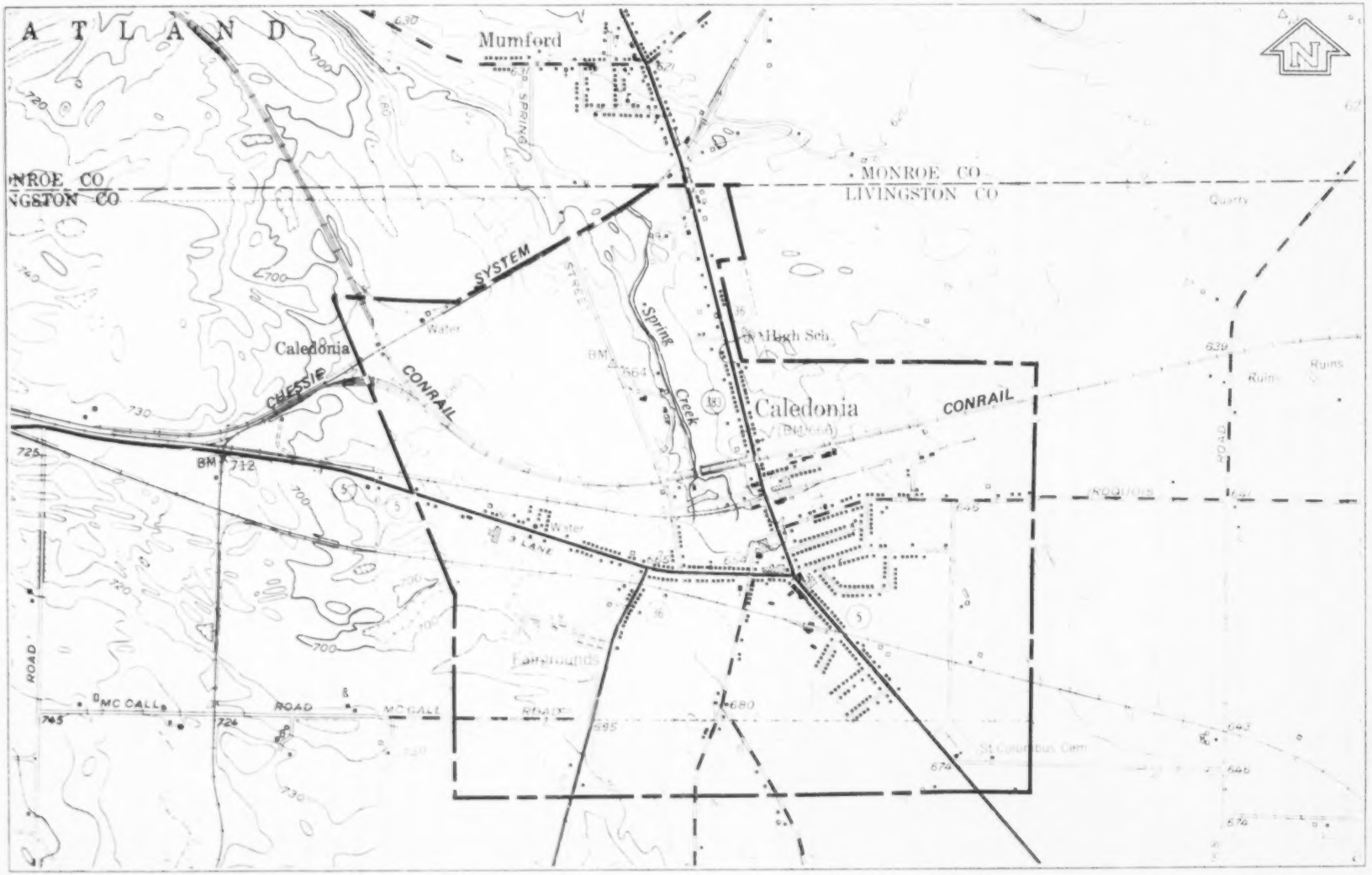


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF CALEDONIA, NY
(LIVINGSTON CO.)

APPROXIMATE SCALE
2000 0 2000 4000 6000 FEET

VICINITY MAP

The Village of Caledonia lies in the Erie-Ontario lowland region of western New York State (Reference 3). The village is generally flat, with elevations ranging from about 680 feet at the highest point to 640 feet along Spring Creek.

Soils in the village are mostly either Farmington Loam, a shallow soil with frequent out-crops and stone fragments, or Palmyra Gravelly Loam, a porous soil which absorbs rain readily. The creek bottom land is mostly wet muck (Reference 4).

The climate of the area is characteristic of central New York State, with warm summers and cold winters with moderate to heavy snowfall. Mean daily temperatures range from 24 degrees Fahrenheit (°F) in January to 71°F in July. The average annual precipitation is 31 inches, of which 15 inches become runoff (Reference 5).

The Village of Caledonia covers an area of 2.0 square miles, with some agricultural land. The remainder is brushland and forest in which hardwoods predominate (Reference 6).

2.3 Principal Flood Problems

The principal flooding source in the Village of Caledonia is Spring Creek, which rises in the central part of the community from a prolific spring complex in the limestone bedrock. The flat topography of the village contributes to poor drainage and sheet flow flooding. Surface drainage in the village flows to the creek, which leaves the community at its northern border. Heavy rains, especially those which occur in the spring and combine with snowmelt, have frequently caused high water and local flooding in the village.

Figure 2 shows the projected elevations of the 100- and 500-year floods at a location on Spring Creek.

2.4 Flood Protection Measures

There are no structures constructed specifically for flood control purposes in the study area. However, there is a concrete overflow dam built on Spring Creek, about 700 feet upstream of the Chessie System. The width between the dam abutments is 48 feet, with the top of the dam at elevation 640 feet. The overflow weir has a width of 10 feet and a crest elevation of 639 feet. This dam has some regulatory effect on flooding in the village.

Figure 2 - Projected 100- and 500-year Flood Elevations for Spring Creek at the Fish Hatchery in the Village of Caledonia.

3.0 ENGINEERING METHODS

For the flooding source studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Floods having recurrence intervals of 10, 50, 100, and 500 years have been selected as having special significance for flood plain management and for flood insurance premium rates. The analyses reported here reflect current conditions in the watershed of the flooding source.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for the flooding source studied in detail in the community.

There is no USGS gaging station on Spring Creek, therefore, the results of the Flood Insurance Study for the Town of Wheatland were used in the present study (Reference 7). Proceeding upstream, flood discharges on Spring Creek were reduced at the Chessie System because of the flat topography and resultant storage effect, as outlined in a USGS publication on floods in the United States (Reference 8). A summary of peak discharge-drainage area relationships for Spring Creek is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
SPRING CREEK					
At corporate limits	3.9	337	738	1,020	2,065
At Chessie System	3.7	202	443	612	1,239

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding source studied in detail were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along this flooding source.

Work maps for Spring Creek at a scale of 1:2,400 with 5 foot contour intervals were prepared from aerial photographs (Reference 9). Cross sections were obtained by field measurement and all bridges and culverts were surveyed to obtain necessary elevation data and structural geometry. The baseline used for horizontal control was also obtained by field survey. Cross sections were located at close intervals above and below bridges, at natural control sections along the stream length, and at significant changes in ground relief and land use or land cover. The cross sections were plotted on the work maps and channel reach lengths were determined between sections along the centerline of the channel. Overbank reach lengths were measured along the approximate centerline of the effective out-of-channel flow area.

Water-surface elevations for Spring Creek were calculated using the U. S. Army Corps of Engineers (COE) HEC-2 step-backwater computer program (Reference 10), which is in general use for unobstructed flow conditions. The program applies theroems for total energy and friction loss to calculate the water-surface profiles for any cross section of a waterway. The water-surface elevation at the initial cross section can be specified, as at the point of confluence of a tributary, or can be calculated using a slope/area method which uses the slope of the energy grade line and the discharge to determine starting water-surface elevations. Starting water-surface elevations for Spring Creek were taken from the Wheatland Flood Insurance Study.

Roughness coefficients (Manning's "n") were assigned on the basis of on-site field inspections and ground-level photographs. These photographs were compared with USGS calibrated photographs (Reference 11), taking into consideration channel conditions, overbank vegetation and land use. The channel "n" value for Spring Creek was 0.035; the overbank "n" was 0.055.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross-section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

All elevations used in this study are referenced to the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929. Locations of the elevation reference marks used in the study are shown on the maps.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are valid only if hydraulic structures remain unobstructed, and dams and other flood control structures operate properly and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage state and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For the stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:2,400 with a contour interval of 5 feet (Reference 9). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year boundary has been shown.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations and, therefore, may not be subject to flooding. Owing to limitations of the map scale and lack of detailed topographic data, such areas are not shown.

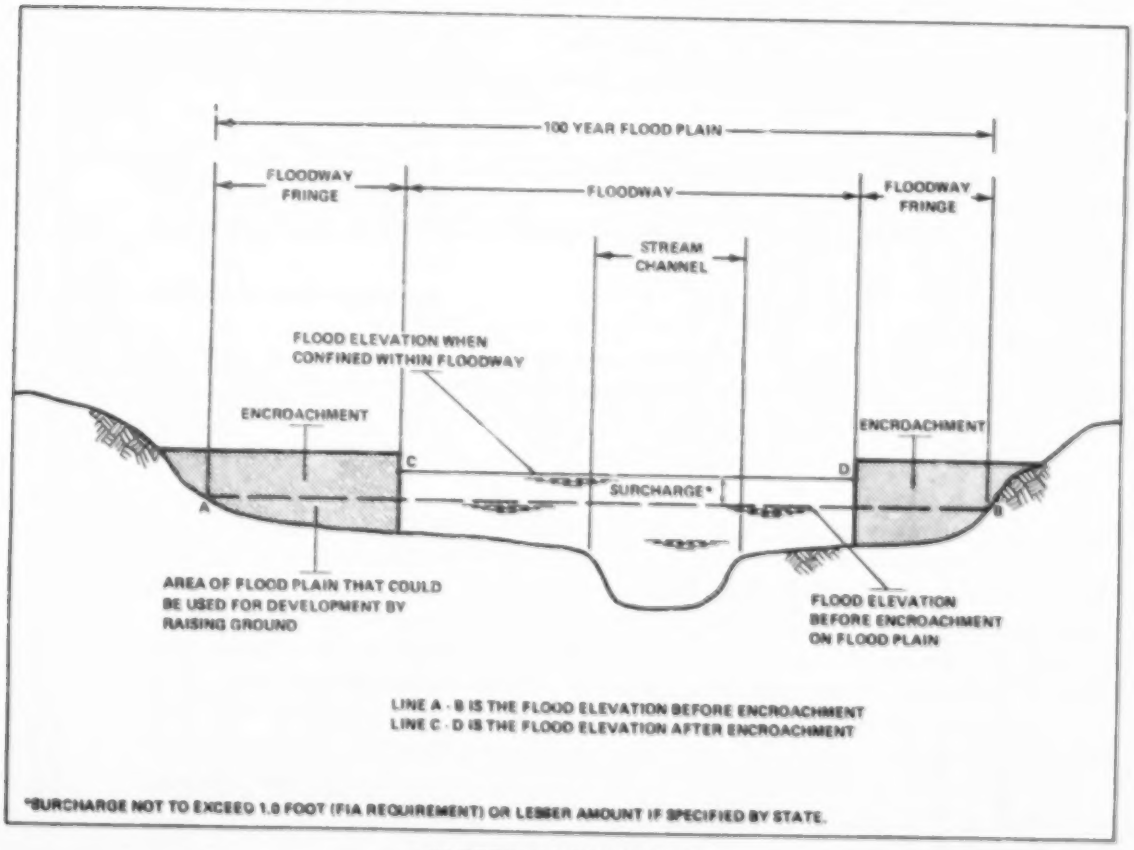
4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood can be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodway in this report is presented to local agencies as a minimum standard that can be adopted or that can be used as a basis for additional studies.

The floodway presented in this study was computed on the basis of equal conveyance reduction from each side of the flood plains. The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown. The floodway computed for Spring Creek is wholly contained within the channel.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 3.


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC

Figure 3

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Spring Creek								
A	635	*	72	8.5	638.1	638.1	638.1	0.0
B	775	*	175	3.5	639.3	639.3	639.5	0.2
C	1,730	*	335	1.8	640.3	640.3	640.4	0.1
D	2,410	*	477	1.3	640.5	640.5	640.6	0.1
E	3,230	*	263	2.3	640.7	640.7	640.8	0.1
F	4,065	*	297	2.1	641.8	641.8	641.9	0.1

[1] Feet above corporate limits

*Floodway coincident with channel banks

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF CALEDONIA, NY
(LIVINGSTON CO.)

FLOODWAY DATA

SPRING CREEK

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for the flooding source affecting the Village of Caledonia.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding source of the Village of Caledonia are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is the FIA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Spring Creek							
Reach 1	01	-1.8	-0.6	+1.2	020	A4	Varies
Ponding Area	01	Shallow	Flooding -	Average Depth 1 Foot		A0	--

[1]Flood Insurance Rate Map Panel
[2]Weighted average
[3]Rounded to the nearest foot - see map

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF CALEDONIA, NY
(LIVINGSTON CO.)

FLOOD INSURANCE ZONE DATA

SPRING CREEK

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Village of Caledonia was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A0:	Special Flood Hazard Areas inundated by types of 100-year shallow flooding where depths are between 1.0 and 3.0 feet; depths are shown, but no FHFs are determined.
Zone A4:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also, areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding source studied in detail in the Village of Caledonia.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Village of Caledonia is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

In 1973, the COE published a Flood Plain Information Report for the Town of Wheatland, to the north of the Village of Caledonia (Reference 12). In addition, a Flood Insurance Study for the Town of Wheatland has been published by the FIA (Reference 7) and a Flood Insurance Study for the Town of Caledonia is being prepared (Reference 13). Data and results of this study have been coordinated to ensure exact agreement with these other studies.

This study is authoritative for purposes of the Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Insurance and Mitigation Division of the Federal Emergency Management Agency, Regional Director, Region II Office, 26 Federal Plaza, Room 1315, New York, New York 10278.

8.0 BIBLIOGRAPHY AND REFERENCES

1. Caledonia-Mumford Bicentennial Committee, Caledonia-Mumford Bicentennial Book, Caledonia, New York, 1976.

2. State of New York, Department of State, New York Legislative Manual 1976, Albany, New York, 1976.

3. J. H. Thompson, Geography of New York State, Syracuse, New York, Syracuse University Press, 1966.

4. U. S. Department of Agriculture, Soil Conservation Service, Soil Survey, Livingston County, New York, Ithaca, New York, August 1956.

5. R. A. Mordoff, Cornell Miscellaneous Bulletin 33, The Climate of New York State, Ithaca, New York, 1959.

6. State of New York, Economic Development Board, Land Use and Natural Resources Inventory of New York State, Albany, New York, 1973.

7. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Town of Wheatland, Monroe County, New York, Washington, D. C., September 1978.

8. U. S. Department of the Interior, Geological Survey, Water-Supply Paper 1672, Magnitude and Frequency of Floods in the United States, Part 1-B. North Atlantic Slope Basins, New York to York River by Richard H. Tice, Washington, D. C., 1968.

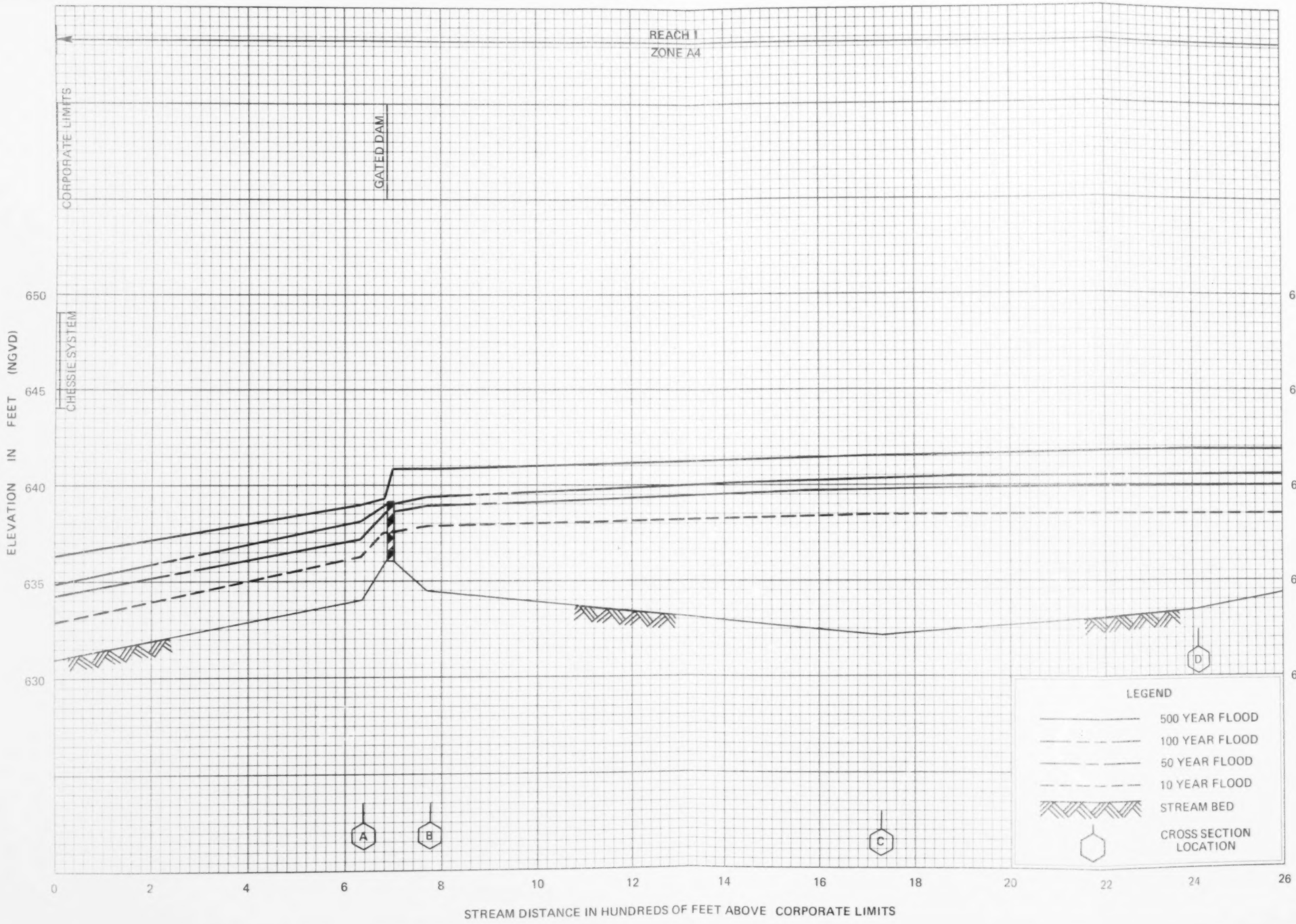
9. Phillips and Associates of Liverpool, New York, Topographic Maps Compiled from Aerial Photographs, Scale 1:2,400, Contour Interval 5 Feet: Caledonia, New York, flown in April 1976.

10. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Generalized Computer Program, Davis, California, October 1973, updated November 1976.

11. U. S. Department of the Interior, Geological Survey, Water-Supply Paper 1849, Roughness Characteristics of Natural Channels by Harry H. Barnes, Jr., Washington, D. C., 1967.

12. U. S. Army Corps of Engineers, Buffalo District, Flood Plain Information Report, Oatka Creek and Genesee River in the Town of Wheatland, Monroe County, New York, Buffalo, New York, April 1973.

13. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Town of Caledonia, Livingston County, New York, Washington, D. C., December 1980.



FLOOD PROFILES

SPRING CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

VILLAGE OF CALEDONIA, NY
(LIVINGSTON CO.)

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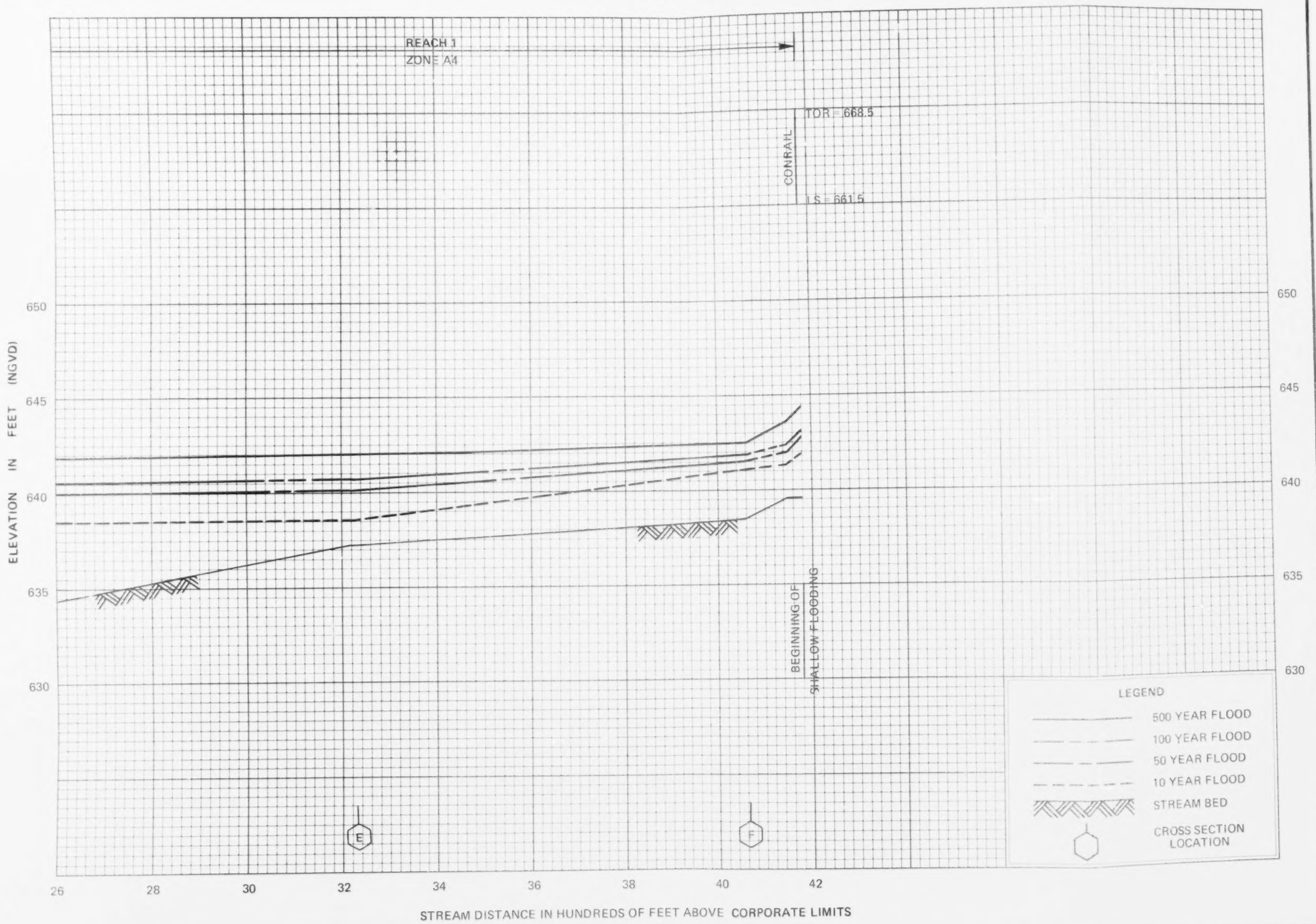

FLOOD PROFILES

SPRING CREEK

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